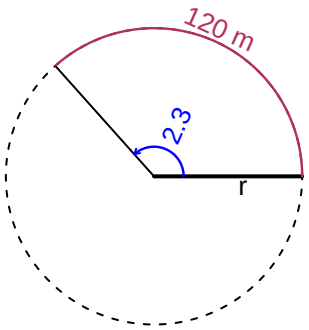
Name: Date:

Trig Final (Solution v41)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 120 meters. The angle measure is 2.3 radians. How long is the radius in meters?

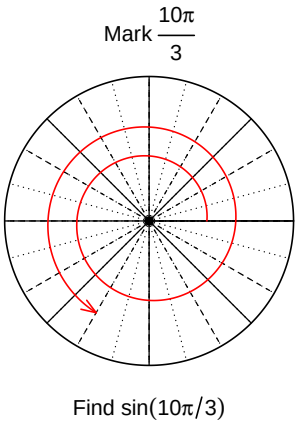


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

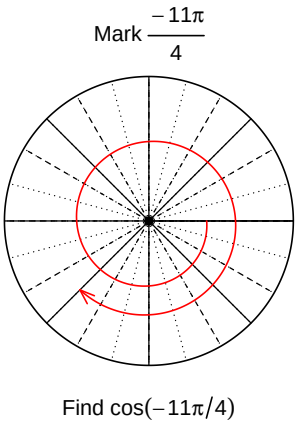
$r = 52.17$ meters.

Question 2

Consider angles $\frac{10\pi}{3}$ and $\frac{-11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{10\pi}{3}\right)$ and $\cos\left(\frac{-11\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(10\pi/3)$



Find $\cos(-11\pi/4)$

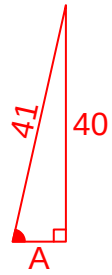
$\sin(10\pi/3) = \frac{-\sqrt{3}}{2}$

$\cos(-11\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{-40}{41}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

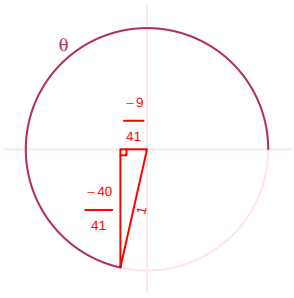
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 40^2 = 41^2$$
$$A = \sqrt{41^2 - 40^2}$$
$$A = 9$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-40}{41}}{\frac{-9}{41}} = \frac{40}{9}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = 3.98$ meters, a frequency of 2.15 Hz, and an amplitude of 5.72 meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 5.72\sin(2\pi 2.15t) + 3.98$$

or

$$y = 5.72\sin(4.3\pi t) + 3.98$$

or

$$y = 5.72\sin(13.51t) + 3.98$$